In The Claims:

Please cancel Claims 1 through 38 without prejudice and add the following new claims:

39. (New) A system for increasing throughput and channel capacity of an optical communications network comprising;

a plurality of transmitter data processors for time division multiplexing a plurality of data channel inputs received into a plurality of temporal and spatial data streams;

a plurality of optical sources being directly modulated by said plurality of temporal data streams into a plurality of temporally modulated optical signals;

a plurality of polarization modulators for spatially modulating the polarization states of said plurality of temporally modulated optical signals with said plurality of spatial data streams received from said plurality of transmitter data processors into a plurality of space-time modulated optical signals;

a wavelength division multiplexer for wavelength division multiplexing said plurality of space-time modulated optical signals from said plurality of polarization modulators;

a fiber optic cable receiving and transmitting wavelength division multiplexed optical signals from said wavelength division multiplexer;

a wavelength division demultiplexer for demultiplexing said

wavelength division multiplexed optical signals transmitted by said fiber optic cable;

a plurality of polarization demodulators for polarization demodulating a plurality of wavelength division demultiplexed optical signals received from said wavelength division demultiplexer into a plurality of polarization demodulated data streams;

a plurality of detectors for direct detection of a plurality of temporal data streams from said plurality of polarization demodulators;

a plurality of receiver data processors for demultiplexing said plurality of temporal data streams from said plurality of detectors and a plurality of spatial data streams from said plurality of polarization demodulated data streams into a plurality of data output channels;

whereby channel capacity and throughput of said optical communications network is substantially increased.

40. (New) The system according to Claim 39 in which said plurality of polarization modulators are digital modulators.

41. (New) The system according to Claim 40 in which said digital modulators produce a plurality of polarization levels to map to 2^M distinct states where M equals the number of polarization levels.

42. (New) The system according to Claim 39 in which said plurality of polarization demodulators are Stokes parameter estimators having a control loop for tracking polarization state changes; and a decision logic block.

43. (New) The system according to Claim 39 including one or more optical amplifiers in said fiber-optical cable to extend the transmission distance of said fiber-optics cable.

44. (New) The system according to Claim 39 including a multiple channel optical wavelength channel multiple cross-connect inserted in said fiber-optics cable for reusing each wavelength channel multiple times for connecting additional transmitters and receivers.

45. (New) The system according to Claim 39 in which said plurality of optical sources are directly modulated at the inputs by said plurality of temporal data streams.

46. (New) The system according to Claim 39 which said plurality of optical sources are indirectly temporally modulated in amplitude at the outputs of said plurality of polarization modulators by said plurality of spatial and temporal data streams from said plurality of transmitter data processors.

47. (New) The system according to Claim 46 in which said plurality of optical sources are indirectly temporally modulated in phase at the outputs of said plurality of polarization

modulators by said plurality of spatial and temporal data streams from said plurality of transmitter data processors.

48. (New) The system according to Claim 46 in which said plurality of optical sources are indirectly temporally modulated in frequency at the outputs of said plurality of polarization modulators by said plurality of spatial and temporal data streams from said plurality of transmitter data processors.

49. (New) The system according to Claim 46 in which said plurality of polarization modulators are a plurality of electro-optics modulators.

50. (New) The system according to Claim 39 which said plurality of detectors for direct detection of a plurality of temporal data streams from said plurality of polarization demodulators are photo-detectors.

51. (New) The system according to Claim 46 in which said plurality of detectors are a plurality of coherent optical demodulators for temporal demodulation of optical signals received from said plurality of polarization demodulators.

52. (New) The system according to Claim 51 in which each of said plurality of coherent optical demodulators performs homodyne demodulation.

53. (New) The system according to Claim 51 in which each of said plurality of coherent optical demodulators performs heterodyne demodulation.

54. (New) The system according to Claim 46 including optical amplifiers inserted in said fiber-optical cable for extending transmission distances.

55. (New) The system according to Claim 46 including an optical wavelength cross-connect inserted in said fiber-optic transmission cable to reuse each wavelength multiple times for connecting transmitters and receivers.

56. (New) The system according to Claim 39 in which said network is a fiber-optics transmission ring network.

57. (New) The system according to Claim 56 in which;

said ring network includes a plurality of add/drop nodes each operating at a specific wavelength with L time division multiplexed channels;

said plurality of add/drop nodes being between said wavelength division multiplexer and said wavelength division demultiplexer.

58. (New) The system according to Claim 57 in which each of said plurality of add/drop nodes has a receiver/transmitter pair.

59. (New) The system according to Claim 46 in which said network is a fiber-optics transmission ring network.

60. (New) The system according to Claim 59 in which;

said ring network includes a plurality of add/drop nodes each operating at a specific wavelength with L time division multiplexed channels;

said plurality of add/drop nodes being between said wavelength division multiplexer and said wavelength division demultiplexer.

61. (New) The system according to Claim 60 in which each of said plurality of add/drop nodes has a receiver/transmitter pair.

62. (New) The system according to Claim 39 in which said optical network is a star coupled network having a plurality of nodes connected by a star coupler.

63. (New) The system according to Claim 62 in which said plurality of nodes comprise;

a transmitter/receiver data processor;

an optical source receiving temporal data from said transmitter/receiver data processor;

a polarization modulator receiving spatial data from said transmitter/receiver data processor, said polarization modulator being connected to said star coupler for distribution of

wavelength multiplexed signals to all of said plurality of other nodes;

a wavelength demultiplexer for extracting a wavelength division multiplexed signal;

a polarization demodulator receiving an output from said wavelength demultiplexer;

a photo-detector receiving an output from said polarization demodulator;

a coupler for distributing a wavelength division multiplexed signal;

whereby each of said nodes distributes a signal at an optical wavelength to the star coupler and it demultiplexes wavelengths from the star coupler, demodulates the polarization and photo-detects received time division multiplexed data streams of spatial and temporal data for delivery to said transmitter/receiver data processor.

64. (New) The system according to Claim 46 in which said optical network is a star coupled network having a plurality of nodes connected by a star coupler.

65. (New) The system according to Claim 64 in which said plurality of nodes comprise;

a transmitter/receiver data processor;

an optical source receiving temporal data from said transmitter/receiver data processor;

a polarization modulator receiving spatial data from said transmitter/receiver data processor;

said polarization modulator being connected to said star coupler for distribution of a wavelength multiplexed signals to all of said plurality of other nodes;

a wavelength demultiplexer for extracting a wavelength division multiplexed signal;

a polarization demodulator receiving an output from said wavelength demultiplexer;

a photo-detector receiving an output from said polarization demodulator;

a coupler for distributing a wavelength division multiplexed signal;

whereby each of said nodes distributes a signal at an optical wavelength to the star coupler and it demultiplexes wavelengths from the star coupler, demodulates the polarization and photo-detects received time division multiplexed data streams of spatial and temporal data for delivery to said transmitter/receiver data processor.

66. (New) A method of increasing transmissions through an optical communication network comprising;

time division multiplexing a plurality of data channel inputs into a plurality of temporal and spatial data streams;

providing a plurality of optical sources;

temporally modulating in intensity said plurality of optical sources by said plurality of temporal data streams;

spatially modulating the polarization states of said plurality of temporally modulated optical sources by said plurality of spatial data streams into a plurality of space-time modulated optical signals;

wavelength division multiplexing and demultiplexing said plurality of space-time modulated optical signals;

time division demultiplexing a plurality of space-time demodulated data streams in a pluarlity of receiver data processors;

whereby channel capacity and throughput of said optical communications network is substantially increased.

67. (New) The method according to Claim 66 in which said wavelength division multiplexing of said plurality of polarization modulated optical signals comprises;

transmitting wavelength division multiplexed optical signals over a fiber-optic transmission line;

demultiplexing said wavelength division multiplexed optical signals received over said fiber-optic transmission line;

polarization demodulating said plurality of demultiplexed optical signals;

detecting and directly demodulating said plurality of optical signals into spatial and temporal data streams.

68. (New) The method according to Claim 66 in which said spatially modulating the polarization states are polarization modulation by a digital modulator.

69. (New) The method according to Claim 66 including cross-connecting multiple sets of optical wavelength channels to allow each optical wavelength channel to be used multiple times.

70. (New) The method according to Claim 66 wherein temporal modulation by a plurality temporal data streams comprises indirect modulation of said plurality of optical sources in amplitude, phase and/or frequency by said temporal data stream.

71. (New) The method according to Claim 67 wherein detecting comprises coherent optical detection using homodyne demodulation.

72. (New) The method according to Claim 67 wherein detecting comprises coherent optical detection using heterodyne demodulation.

73. (New) The method according to Claim 66 wherein said time division multiplexing of a plurality of channels of an optical communication network comprises time division multiplexing channels of a wavelength division multiplexed ring network.

74. (New) The method according to Claim 66 wherein said time division multiplexing of a plurality of channels of an optical communication network comprises time division multiplexing channels of a star coupled optical communication network.

75. (New) The method according to Claim 66 wherein said time division multiplexing of plurality of channels of an optical communication network comprises a fiber-optic data bus network.

76. (New) The method according to Claim 75 in which said data bus network comprises multiple network interface units operating at a plurality of wavelengths.